Journal of the Royal Society of Arts

NO. 4936 FRIDAY, 15TH OCTOBER, 1954 VOL. CII

FORTHCOMING MEETINGS

MONDAY, 25TH OCTOBER, AT 6.30 p.m. Special Meeting for the Presentation of R.D.I. Diplomas and the Bicentenary Medal by E. Munro Runtz, F.R.I.C.S., Chairman of the Council. The presentations will be followed by an Address, entitled '*The Seeing Eye*', by Sir Francis Meynell, Master of the Faculty of Royal Designers for Industry.

WEDNESDAY, 3RD NOVEMBER, AT 2.30 p.m. Inaugural Address. '*Looking Ahead*', by E. Munro Runtz, F.R.I.C.S., Chairman of the Council. After the address medals will be presented by the Chairman, and tea will be served in the Library at the conclusion of the proceedings.

WEDNESDAY, 10TH NOVEMBER, AT 2.30 p.m. '*The Place of the Film in the Age of Television*', by Roger Manvell, Ph.D., Director, British Film Academy. Sir Stephen Tallents, K.C.M.G., C.B., C.B.E., a Member of Council of the Society, will preside.

Fellows are entitled to attend any of the above meetings without tickets and may also bring two guests. When they cannot accompany their guests, Fellows may give them special passes, books of which can be obtained on application to the Secretary.

PRESENTATION OF SWINEY PRIZE

The Swiney Prize for 1954 has now been presented to Professor G. W. Paton, Vice-Chancellor of the University of Melbourne, and a report of the presentation, which was made by Mr. John Cain, Premier of Victoria, has been forwarded by Sir John Lienhop, Agent-General for Victoria in the United Kingdom. About forty guests attended the ceremony, which took place on 2nd September at Parliament House, Melbourne. They included a number of Cabinet Ministers and their wives; the President of the Legislative Council, Sir Clifden Eager, and Lady Eager; the Speaker of the Legislative Assembly, the Honble. P. K. Sutton, M.L.A., and Mrs. Sutton; the Leader of the Opposition, the Honble. H. E. Bolte, M.L.A., and Mrs. Bolte; the Chief Justice, Lieut.-General the

By courtesy of The Age, Melbourne

Lord Radnor handing the Cup to Sir John Lienhop

Honble. Sir Edmund Herring, a Fellow of the Society, and Lady Herring; the Deputy Chancellor of Melbourne University, the Honble. Mr. Justice Dean, and Mrs. Dean; Lady Lowe, wife of the Honble. Sir Charles Lowe,

By courtesy of The Age, Melbourne

The Premier of Victoria presenting the Cup to Professor Paton

the Chancellor of Melbourne University; Professor F. P. Donovan, Faculty of Law, Melbourne University, and Mrs. Donovan; Professor J. T. A. Burke, Professor Fine Arts, Melbourne University, and Mrs. Burke; Dr. I. J. Wood, Chairman of the Royal College of Physicians, and Mrs. Wood; and the following Fellows of the Royal Society of Arts and their wives: Sir John Medley and Lady Medley; Dr. E. G. Coppel and Mrs. Coppel; Dr. E. Lisle-Cocking and Mrs. Lisle-Cocking, and Professor S. M. Wadham and Mrs. Wadham.

The covered Cup, made in silver by Messrs. Padgett & Braham Limited to the design of Professor R. Y. Goodden, R.D.I.

A report of the short ceremony in June, at which the Swiney Prize was handed over by the Earl of Radnor, then Chairman of the Council, to Sir John Lienhop for transmission to Victoria, has already been published in the *Journal*. Photographs of both ceremonies have now been received and have been reproduced in this issue of the *Journal* because of the unusual interest of the sequence of presentations involved in this year's award.

THOMAS GRAY MEMORIAL TRUST

AWARD OF PRIZES FOR MERCHANT NAVY TRAINING BOARD EXAMINATIONS

The names of the winners of the medals and prizes offered this year under the Thomas Gray Memorial Trust, to Merchant Navy apprentices and cadets obtaining the first five places in each section of the Annual Examinations of the Merchant Navy Training Board, have now been announced and are set out below. These examinations are divided into three sections, for apprentices and cadets in their first, second and third years of apprenticeship, and the following medals and prizes have been awarded: in the third-year examinations, five silver medals; in the second-year examinations, five bronze medals; and in the first-year examinations, five telescopes.

Third Year

J. W. R. Allnutt (Shell Tankers, Ltd.)
J. P. Barber (Prince Line, Ltd.)
S. S. Cutlack (Andrew Weir Shipping & Trading Co., Ltd.)
M. J. Dove (The Hain Steamship Co., Ltd.)
B. W. J. Mills (Moss Hutchison Line, Ltd.)

Second Year

R. J. D. Elston (British India Steam Navigation Co., Ltd.)
T. F. S. Fripp (Shell Tankers, Ltd.)
P. T. Gaskell (Elder Dempster Lines, Ltd.)
E. J. Norman (Silver Line, Ltd.)
G. Ross (Dene Shipping Co., Ltd.)

First Year

M. R. Burch (Port Line, Ltd.)
B. Hope (Prince Line, Ltd.)
H. S. Maini (British India Steam Navigation Co., Ltd.)
I. W. Waller (Blue Star Line, Ltd.)
R. B. Weeks (Furness, Withy & Co., Ltd.)

ISSUE OF TEN-VOLUME INDEX

A comprehensive index of the *Journal* for the years 1942 to 1952 is about to be published at a price of five shillings. The great value for reference purposes of this index, which extends to 64 pages and covers the *Journal* from Volumes 91 to 100, is obvious, and it would be helpful in calculating the number to be printed if those requiring copies would apply for them to the Secretary as soon as possible.

FACILITIES FOR FELLOWS

Fellows are reminded that the accommodation which is available for their use at the Society's premises includes the Library, which has a loan collection as well as a reference section, and the Parlour, which may be used as a reading and writing room and as a meeting place for themselves and their friends when in London.

Light refreshments, such as morning coffee, sandwiches and afternoon tea can be ordered between 10 a.m. to 5.30 p.m. (Saturdays to 12.30 p.m.).

ENGINEERING DEVELOPMENTS IN CENTRAL AFRICA

A paper by

SIR WILLIAM HALCROW, M.I.C.E., M.I.Mech.E.,

read to the Commonwealth Section of the Society on Tuesday, 18th May, 1954, with Sir Gilbert Rennie, G.B.E., K.C.M.G., M.C., the High Commissioner for the Federation of Rhodesia and Nyasaland, in the Chair

THE CHAIRMAN: It is my pleasant duty this evening to introduce Sir William Halcrow, who really needs no introduction from me in this company. As you know, he is going to talk to us on the subject of 'Engineering Developments in Central Africa'. As you also know, he is the senior partner of Sir William Halcrow & Partners, Consulting Civil Engineers, who have been responsible for many large public works both at home and abroad. Sir William himself has had over half a century's experience in the design and construction of hydro-electric works, and he has been responsible in particular for many works in the Highlands of Scotland. He is a past President of the Institute of Civil Engineers, and has served on more government committees than I should care to mention to-day. He also has a very extensive knowledge of Africa, having been responsible for the design and construction of the port of Beira in Portuguese East Africa. He was chairman of the panel of consulting engineers that reported on the Kariba and Kafue schemes in the Rhodesias, and at the present time his firm has been engaged by the Government of Nyasaland to report on power projects in that country. His firm is also engaged on work for the Gold Coast Government for the Volta River.

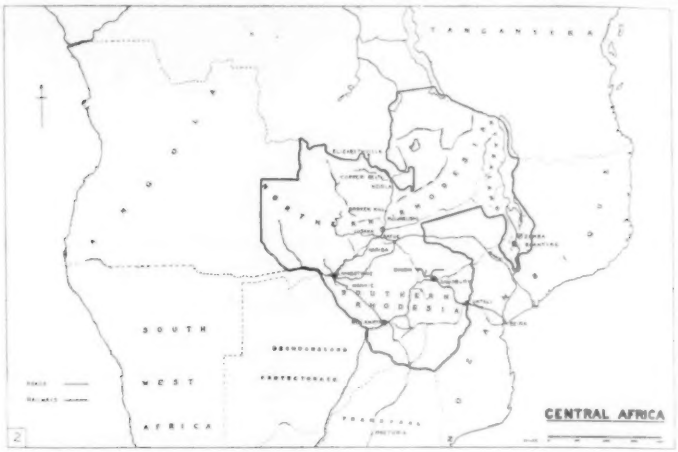
The following paper, which was illustrated with lantern slides, was then read:

THE PAPER

I much appreciate the honour of being invited to lecture to the Royal Society of Arts this evening. The subject suggested to me—engineering developments in Central Africa—is a very wide one. It is so wide in fact as to be beyond the scope of a short lecture and I feel therefore that it will be of greater service if I confine my remarks mainly to the use of water for the development of hydro-electric power, which is one of the principal factors in the future development of the country.

Central Africa may be taken as comprising the three countries which have recently been brought into Federation—Southern Rhodesia, Northern Rhodesia and Nyasaland.

Southern Rhodesia, a self-governing colony since 1923, comprises Mashonaland and Matabeleland. It has an area of 150,000 square miles, or about $1\frac{3}{4}$ times that of Great Britain, and a population, in 1951, of 2,146,000, including 136,000 Europeans, 10,000 Asiatics and others, and two million



Africans. Situated at an elevation of 3,000 to 5,000 feet above sea level, it has a temperate climate. There is a considerable mining industry, the principal minerals being asbestos, chrome, iron and gold, but the major industry is at present agriculture and cattle raising. Secondary industries include grain mills, light engineering, furniture works, brick and tile works, cotton mills and others.

Northern Rhodesia lies to the north of Southern Rhodesia, from which it is separated by the Zambesi river. It is mainly a plateau, at an elevation of 3,000 to 5,000 feet. Its area is about 290,000 square miles, or about $3\frac{1}{8}$ times that of Great Britain and its population in 1951 was 1,700,000, including 37,000 Europeans and nearly 4,000 Asiatics and others. It has been far less colonized than its southern neighbour and while considerable agriculture and stock raising are carried on, by far its greatest industry is mining. Its copper mines are the most important in the world, but its mineral wealth generally is very great and includes zinc, lead, vanadium, cobalt, silver and gold. The total value of mineral production in 1951 exceeded £72 million and it is rapidly expanding.

The Nyasaland Protectorate, established in 1891 and lying to the east of Northern Rhodesia, includes the western shores of Lake Nyasa, the high plateau separating it from the Luangwa basin, the area between the watersheds of the Zambesi and Shire rivers and Lakes Chiuta and Shirwa to the east. The land area is nearly 37,000 square miles or about two-fifths of that of Great Britain, and its population in 1951 was 2,400,000 including some 4,000 Europeans and 5,000 Asiatics. It is primarily an agricultural country and there are no major industries apart from this.

One of the most important factors in the development of a new country is the provision of adequate communications and those existing will undoubtedly need considerable extension to keep pace with the industrial expansion in

Central Africa. The Rhodesias are served by the Rhodesian Railways system. Commencing at Vryburg and connected with the Union of South Africa Railways, and with the Port of Beira, it affords communication between Cape Town, Bechuanaland, Southern and Northern Rhodesia, the Belgian Congo and Portuguese East Africa, with branches to the chief towns and mining centres. The Rhodesian Railways have a total milage of 2,436. For Nyasaland, a railway from Beira passes through Blantyre to Chipoka at the southern end of Lake Nyasa where it connects with the lake steamer service owned by the railway company.

In Southern Rhodesia there is a fairly extensive road system, and motor services with a route milage of 2,760 supplement the railways. In Northern Rhodesia the road system is less developed but a trunk road follows the railway line to Elizabethville and main roads run to Abercorn on the extreme north and to Fort Jameson on the east, continuing on to connect with the Nyasaland road system. Considerable lengths of the Rivers Zambesi, Kafue and Chambesi are navigable. The total milage of roads in Nyasaland is 4,765 but many of the roads are open only in the dry season. There is a considerable waterborn traffic on Lake Nyasa. Central African Airways, jointly owned by the three Governments, provide regular air services throughout the territories.

With its great mineral wealth and agricultural opportunities Central Africa affords scope for industrial expansion, the realization of which will depend largely on improved communications and a plentiful supply of cheap power. It is the latter aspect which I propose to discuss, more particularly from the point of view of hydro-electric development.

The main sources of thermal power are oil and coal. Oil is not found in Central Africa and the high cost of imported oil renders it uneconomical for large-scale power production. There are valuable coal fields at Wankie in Southern Rhodesia and these supply the bulk of the fuel for the steam stations throughout the three territories, including those at the mines in the Copper Belt. The Broken Hill mines produce their own power from hydro-electric stations. Any considerable increase in the thermal station capacity would raise an acute problem of coal supply as, although the Wankie Collieries are being extended, the transport of a greatly increased quantity of coal would throw an undue burden on the somewhat restricted railway system.

When it is realized that Wankie is 180 miles by rail from Bulawayo, 240 miles from Salisbury and nearly 600 miles from the Copper Belt, and that most of the line is single track, it will be seen that the possibilities of meeting the expanding needs of Central Africa by coal-fired steam stations are limited. This situation naturally points to the development of hydro-electric power, for which great opportunities occur on the rivers of the Zambesi system. These include the Zambesi itself and its tributaries, the Kafue, the Lunsemfwa and others. Water power in Central Africa at present is in its infancy. Apart from the hydro-electric stations owned by the Broken Hill mines, already referred to, and small stations at Victoria Falls and at Zomba in Nyasaland for purely local supply, no water power has as yet been developed.

Early attention was attracted to the possibilities of the Victoria Falls at Livingstone on the Zambesi, and many years ago the Victoria Falls and Transvaal Power Company was formed with the object of developing power at the Falls for transmission to the Rand Mines. It was not found a practicable proposition, but the company built a small station at the Falls for local supply to Livingstone and erected steam stations on the Rand in the vicinity of the mines. The Victoria Falls present a most spectacular sight with the great Zambesi river advancing on a wide front and pouring into a narrow ditch-like gorge whose only exit is a central cleft which, following a zigzag course, is crossed by the road and railway bridge. In times of flood the whole gorge is enveloped in mist and the opposite shore is a rain forest. Even in the dry season there is a constant cloud of spray above the Falls which is visible from many miles distant and has the appearance of smoke.

The Victoria Falls have a height of about 300 feet and the potential average power which could be obtained from them is of the order of 750,000 kW. The dry season flow is, however, only about a quarter of the average flow and corresponds to a power potential of say 190,000 kW. The river is in flood from January to May when a vast volume of water passes down. The topography of the country above the Falls is such as to present no opportunity for creating a large storage reservoir of such capacity as to hold a substantial part of the flood water and so regulate the river to increase materially the dry season flow. Hence the power potential is limited to that available in the dry season.

The only hydro-electric development of any size in Central Africa is that carried out by the Broken Hill mines company. They have two power stations—one on the Mulungushi river with a capacity of 20,000 kW and the other on the Lunsemfwa river of 12,000 kW. A larger scheme has been projected on this river with a capacity of 66,000 kW but its construction has been deferred pending decisions to proceed with the major schemes to which I will presently refer.

Whilst the existing hydro-electric power in Central Africa is thus almost negligible, the potential power which can be developed to meet the increasing demand is vast. Two great projects have been closely investigated and may be expected to materialize in the not too far distant future. These are the Kariba Gorge Scheme on the Zambesi river and the Kafue scheme on the Kafue, a tributary of the Zambesi. I propose to give a brief outline of each.

In 1948 the Central African Council appointed a panel of four engineers, of which I was the chairman, to investigate and report on the Kariba and Kafue schemes. My colleagues were Messrs. Gourley, Pickworth and Kennedy. Our report was presented in December, 1950.

The Kariba scheme is situated in the Kariba Gorge on the Zambesi, about 225 miles downstream from Livingstone. Here the river enters a narrow gorge of some 16 miles in length through which it passes with only a slight fall. A high dam at any suitable point in this gorge would pond the water back over a great distance and form a vast lake. The catchment area above the gorge is some 300,000 square miles and the average flow in the river is about 37,000 cubic feet a second. It has, however, a large seasonal variation and whilst in the dry

The Kariba Gorge

season it may fall to 7,000 cubic feet a second or less, in the floods it may rise to 300,000 cubic feet a second or even more—that is over forty times as much. The topography is such, however, that a large storage can be created whereby the flow of the river can be regulated. The proposal is to construct a dam across the gorge some 400 feet in height. This will pond the river back to form a great lake some 150 miles long—roughly the distance from London to Sheffield. This lake will be so vast that the storage in a top layer of less than 40 feet will be sufficient to permit of complete regulation of the river flow. The surplus water in the floods and in years of heavy rainfall will be stored and released as required to give a constant discharge in the river.

Considerable engineering problems arise in the construction of a high dam across a great river like the Zambesi, subject to heavy seasonal floods. During construction it is proposed to divert the water through four diversion tunnels each of 50 feet in diameter. The dam will be constructed in the dry between cofferdams.

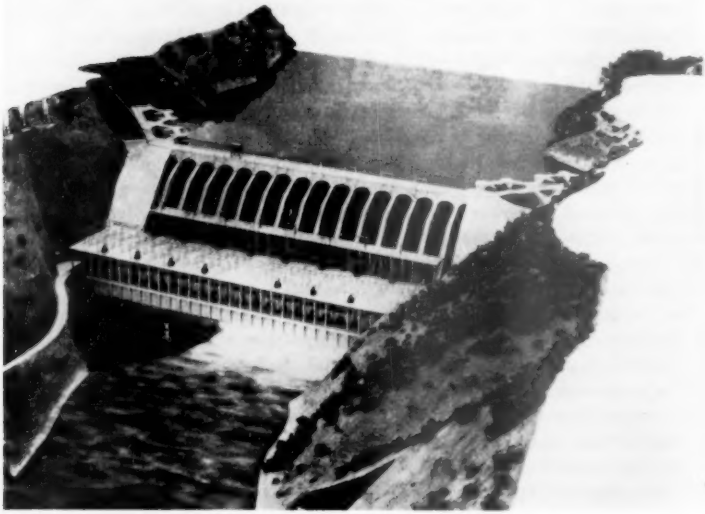
Two or more of these tunnels will subsequently be adapted as spillway tunnels for flood water, the surplus water being passed through high level automatic gates to a downtake shaft leading to the tunnel, the former low level intakes used for diversion being sealed off.

Alternative sites for the dam are under consideration; one near the upper end and the other near the lower end of the gorge. The lower site presents certain technical advantages but it is not so favourable as regards foundations. At the upper site the river bed is on rock, but at the lower site the rock is overlaid by riverine deposits of considerable thickness. The layout of the station at the two sites would vary. At the lower site the power station would be placed across the

river at the foot of the dam and the turbines would be fed by leading the water through the dam by downtake pipes. The four diversion tunnels would be adapted as spillways. A model of this scheme was prepared for the Rhodes Centenary Exhibition at Bulawayo and exhibited there. At the upper site the dam would be similar but the power house would be detached and located well below the dam on the right flank. Two power tunnels would be constructed with short adits leading to each turbine.

The regulated output capacity of the Kariba scheme is estimated at one million kW at 70 per cent load factor, equivalent to 700,000 kW of continuous power. The cost excluding the transmission system was estimated in December, 1950, at about £44 million. An idea of the capacity of this power station will be gained when it is mentioned that Battersea Power Station with the extension at present in hand has a capacity of 500,000 kW or just half of that of Kariba.

The dam would have to be constructed to its full height before any power could be generated but the scheme could be developed in stages by installing the generating plant as required. An initial installation was proposed of 300,000 kW at 70 per cent load factor, and the estimated cost of this was £30 million excluding transmission. The period of construction of this initial scheme would be about seven years.



A model of the projected Kariba scheme

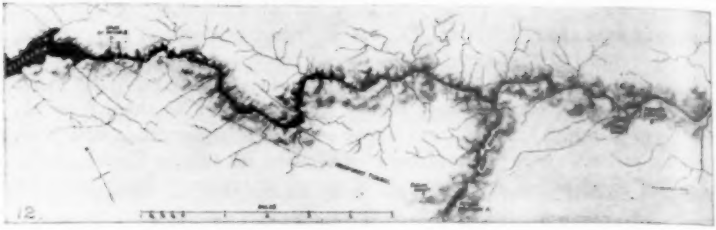
The estimated cost of energy was 0·20*d* per kWh from the initial scheme and 0·10*d* from the full scheme. The cost of energy delivered at the receiving stations and including the cost of and loss in transmission was 0·34*d* for the initial and 0·19*d* for the full schemes. The cost of steam power as given in the Report of 1952 of the Electricity Supply Commission of Southern Rhodesia was 0·55*d* a unit. There has been a rise in costs of construction and plant since the estimates were prepared but even allowing for this the Kariba scheme offers the possibility of a large supply of energy at extremely cheap rates, far below those obtainable from steam power.

The Kafue is a tributary of the Zambesi, which it joins about 25 miles below the Kariba gorge. The Kafue rises on the frontier of the Belgian Congo and running in a generally southerly direction is joined by the Lukanga, a large tributary emerging from a vast swamp. The river then turns, first in a westerly direction and then south to a gap in a ridge of hills known as the Meshi Teshi gap. After passing through here it meanders in an easterly direction across a great flood plain known as the Kafue Flats. This plain has a length of 200 miles and a width of about 150 miles, is extremely flat, and is subject to considerable flooding in wet years. Emerging from the Flats, the river is crossed by railway and road bridges and enters the Kafue Gorge. This is a narrow gorge through which the river passes in a series of falls and cascades to descend 1,900 feet in the 16½ mile length. Leaving the gorge the river crosses some 25 miles of the Zambesi plain to join that river. It is the steep fall through the gorge that offers the opportunity for power development.

The layout of the power scheme is as follows. A dam of about 100 feet in height is to be built across the gorge at its upper end. From here a high level tunnel leads to a point near the Keshya ravine on the right flank of the river. Here a vertical surge shaft is to be constructed and extended as a downtake shaft leading to a short low level tunnel connecting to a power station in the ravine. The total length of tunnel from the dam to the power station is about 8½ miles and the head 950 feet. A second dam across the ravine forms a small forebay from which the water is taken through a second tunnel some five miles in length, similar to the first tunnel and leading to a second power station on the Kafue Gorge. The layout is so arranged that the heads, and consequently the plant, are the same at each power station.

The river, which has wide seasonal and annual variations of flow, undergoes considerable natural regulation in its passage across the Kafue Flats, but the flow at Kafue, though perennial, is still subject to considerable variation, and the site affords no opportunity for creating a large storage lake to regulate this. The 100-foot dam creates a small storage which is valuable in tiding over low flows in the dry season thus enabling a constant discharge to be obtained considerably higher than that determined by the minimum dry weather flow.

It might be thought at first sight that by raising the dam a large lake could be formed on Kafue Flats which would give the requisite storage to regulate the river, but the Flats are, in fact, too large and too flat for this purpose. Raising the dam a few feet would create a vast expanse of shallow water on which the



Sketch-map of the Kafue Gorge, as it will be in the completed scheme; from a drawing by Victor Coverley-Price for the Sphere

evaporation loss would be so great as to preclude the lake being kept full. The storage near the dam site is therefore limited. The nearest other possible storage site is at the Meshi Teshi gap. Investigations are being carried out as to the practicability of a storage dam here and the capacity of the reservoir that would be formed. But this is not the whole problem. It has to be ascertained how much of a regulated flow released at Meshi Teshi would reach the Kafue Gorge after its passage across the 200 miles of the Kafue Flats. The solution of this requires not only extensive survey but, what takes much longer, the collection and building up of hydrological data. The Meshi Teshi project must, therefore, be regarded provisionally as a possible future extension.

The scheme proposed, therefore, is one based on the storage obtainable in the immediate vicinity of the Kafue Gorge, but it has been designed so as to be elastic and readily capable of extension if, by provision of additional storage or otherwise, the available water can be increased. The scheme is estimated to give an initial output of 257,000 kW. at 80 per cent load factor equivalent to 205,000 kW. of continuous power. The cost excluding transmission is estimated at £18 million. The cost of energy is estimated at 0·15d per kWh of energy sent and 0·26d per kWh of energy delivered at the receiving stations after allowing for the cost of and loss in transmission. It is estimated that the complete scheme would take six and a half years to construct but that partial operation could commence after five years.

Comparing the Kariba and Kafue schemes, it will be seen that if construction of both were started at the same time Kafue could commence to supply power in a shorter time than could a Kariba scheme of the same initial size as Kafue, and the cost of energy from Kafue would be lower than of that from Kariba. But Kariba can be extended to give about three and a half times the output of Kafue and the cost of energy from the full development will be considerably less than from Kafue. It is again interesting to compare the characteristics of the two schemes. Kariba on the Zambesi has an enormous volume of flow and the opportunity exists for creating so large a storage as will enable the variable flow to be fully regulated; but it has a relatively small available head. Kafue on the other hand, situated on a tributary of the Zambesi, has a much smaller flow and

An impression of the upstream Kafue dam as it will look when completed; from the drawing by Victor Coverley-Price for the Sphere

no opportunity for storage on a scale to regulate the variations to a high degree. It has, however, a high head nearly seven times that at Kariba.

The Kariba and Kafue schemes should in no sense be considered as rival schemes but as complementary to each other. Both will undoubtedly be required in the not too distant future to meet the growing demands of Central Africa. They have always been looked on as developments to serve both the Rhodesias and in fact the original investigations of both were carried out by the Inter-Territorial Hydro-Electric Power Commission, a body, under the chairmanship of Mr. A. B. Cowen, appointed by the Central African Council and representative of both Southern and Northern Rhodesia.

Much benefit could be derived by interlinking the two schemes, to serve a joint grid. By doing so, the vast storage of Kariba could virtually be utilized to supplement the small storage of Kafue and so to take fuller advantage of the high head of Kafue.

Much discussion has taken place on the relative merits of Kafue and Kariba schemes, but the only real issue that arises is which scheme should be constructed first. This indeed was one of the terms of reference given to the panel for the preparation of their 1950 Report.

They recommended that on purely economic considerations it would be advantageous to construct Kariba first. The grounds for this opinion were these. The Kariba Dam would have to be constructed to its full height before any power could be obtained and extensions would consist of additions of plant. The lesser output of Kafue would only meet the prospective load in the

Rhodesias for a short time and then any addition must come from Kariba. As this involved the construction of Kariba Dam to full height, this incremental energy would become very costly. On the load curves forecast, it was found that within the limits of 400 and 1,000 MW. at 70 per cent load factor, construction of Kafue first would involve a large additional capital expenditure. This view was endorsed by the Inter-Territorial Hydro-Electric Power Commission which was representative of both Rhodesias.

The Government of Northern Rhodesia were, however, not satisfied that Kariba should be developed first, and they invited the panel to investigate and report to them as to whether 200 MW. could be obtained from Kafue at an earlier date than from a partial development of Kariba. The panel reported that 257 MW. could be got from Kafue at a cost per unit less than from an initial development of the same size at Kariba, but considerably more than that from the full development of Kariba. Power supply could start in five years, and reach full service in six and a half as against seven years for the initial Kariba scheme.

The Legislative Assembly of Northern Rhodesia unanimously adopted the Report and decided to proceed with the Kafue scheme. They appointed a Kafue Authority for this purpose on which the Copper Mines were strongly represented. The arguments in favour of constructing Kafue first were that the expanding demands of the Copper Belt necessitated an earlier power supply than could be obtained from Kariba and that it would be easier to raise the £30 million required for Kafue than the considerably larger amount for Kariba. The first argument has been somewhat weakened by the fact that the copper companies have meanwhile arranged for a temporary supply of power from the Belgian Congo.

Meanwhile Federation has come about and power development has become a Federal subject. During the discussion of a Hydro-Electric Bill in the Federal Parliament recently it was evident that there was a considerable body of opinion in favour of constructing Kariba first, and indeed the economic grounds for doing so advanced in the panel's 1950 Report still hold good. The matter appears to have taken somewhat of a political turn so the final issue may be in the melting pot.

These two great schemes do not by any means exhaust the power potential of Central Africa. There are other sites of magnitude on the Zambesi and many smaller sites on its tributaries.

Turning now to Nyasaland, a large part of the country is occupied by the great Lake Nyasa which outflows through the Shire river, which joins the Zambesi at Mutarara, some 250 miles from the lake. The variations in the level of the lake have for long presented a considerable problem. Some years ago the outlet became blocked by silt and reed growth and the flow of the Shire practically ceased for a period of 18 years. During this period extensive cultivation was carried out on the flats adjoining the lower river. The level of the lake meanwhile rose and reached a maximum in 1937, when the bar breached and the river channel rapidly cleared. The cultivated lands on the lower Shire were inundated and became swamps.

Various suggestions have been put forward as to the cause of the variation

Zambesi and Shire floods

of lake level, such as under-water springs, but there seems to be no reason to think that the variations arise from other than natural process of inflow, outflow and evaporation. A lengthy investigation is being now carried out for the Government of Nyasaland on the possibilities of regulating the level of the lake and the discharge of the Shire river. The objects sought are: to restrict the variation of lake level within prescribed limits; to regulate the flow of the Shire river; to reclaim the swamps; to extend irrigation, and to develop power. The upper and lower Shire have very flat gradients but on the middle Shire, which has a length of some 80 miles and falls some 1,400 feet, there are possibilities for power development.

Whilst no large power site exists comparable with those of Kariba and Kafue, there are a number of sites, and the aggregate power that could be realized is considerable and may be of the order of 250 MW. This power will be important both as a local supply and as a valuable contribution to a Central African grid. At present the only hydro-electric power developed in Nyasaland is a small station supplying Zomba, the administrative centre.

The importance of the Nyasa and Shire regulation will be at once evident. Nyasaland is densely populated and large numbers emigrate to the Rand and elsewhere to obtain work. The increased food supply arising from drainage and irrigation, and the employment following the establishment of industries, based on the power development will be of great benefit to the country.

Having discussed at some length prospective hydro-electric developments in Central Africa, we may consider the present and future demand for energy.

In Northern Rhodesia, the principal demand at present arises from the mining industry, which is concentrated in a relatively small area in the famous Copper Belt and the Broken Hill district. Four companies are mining copper—the Roan Antelope, Mufulira, Rhokana and Nchanga. Each has its own steam plant, three of them utilizing waste heat from their smelter plants, and all are dependent on a coal supply from the Wankie coalfields. The power stations of the four mines have recently been interlinked and connected to a Central Switching Station. This joint power supply is operated by the Northern Rhodesia Power Corporation owned by the four copper companies and the present maximum demand is 120,000 kW. with an annual consumption of 800 million kWh. Considerable expansion of the copper industry is taking place and the power demand is increasing rapidly. The Broken Hill Mines produce zinc. They lie about midway between the Copper Belt and Lusaka and, as I have already mentioned, derive power from their own hydro-electric stations on the Mulungushi and Lunsemfwa rivers.

Apart from the mining industry there is a growing demand for power at the centres of Lusaka, Ndola and Livingstone. The first two have their own steam stations whilst Livingstone has a small hydro-electric station near Victoria Falls.

In Southern Rhodesia the demand arises from both industrial developments and mining, but the load is far less concentrated than in Northern Rhodesia. In 1936 the Electricity Supply Commission of Southern Rhodesia was constituted to control the development and supply of electricity. The Commission own various steam stations having an aggregate capacity of 82,000 kW. and a transmission network of 5,000 miles. It now controls the whole public supply with the exception of that served by the municipalities of Salisbury and Bulawayo. It is estimated that by 1961 the total demand in the Rhodesias will reach 600,000 kW.

In Nyasaland the present supply is limited to the larger towns of Zomba, Blantyre and Limbe, the former served by a small hydro-electric plant and the two latter by steam stations.

It will be seen that the present electricity supply of Central Africa is almost entirely dependent on steam stations all of which obtain their coal from the Wankie collieries. These collieries, though they are being extended, will be hard pressed to meet the increasing demand, over and above which there is the difficulty of transport on the somewhat limited existing railway system.

It may be appropriate at this point to refer to the relative advantages of steam and water power as this is a matter of the greatest importance. When a hydro-electric scheme is constructed the capital cost of the undertaking is known and cannot increase. The cost of a unit of power is made up of interest on capital, an amortization fund, and the cost of running and maintaining the power stations which is relatively small. It is customary to write off the cost of civil engineering works—that is, dams, tunnels, pipelines and other foundations, and so on—in

eighty years. As the civil engineering works are usually the greater part of the expenditure, it follows that after eighty years the cost of a unit of energy will be very small indeed. Similar periods for amortizing the plant are forty years for turbines and twenty years for electrical gear. In these cases the money is retained in the undertaking for replacements.

On the other hand, the major item in the cost of steam power is coal. The cost of this varies and tends generally to rise. In England between 1933 and the present day the cost of coal rose no less than five times. The cost of steam power is thus not constant but is dependent on the fluctuating and generally rising market price of coal. Coal is a wasting asset and it has many valuable uses other than as raw fuel. Further, the plant in a steam station has to be replaced every twenty years.

It is clear then that any country which is favoured by extensive water power should develop this to meet its requirements of energy, rather than use up its coal resources which are irreplaceable and may be employed more profitably otherwise.

Any large industrial expansion must inevitably require the development of other sources of power, the obvious one being hydro-electric power. It is an old adage and a very true one in electricity undertakings, that supply creates a demand. With a large available supply of cheap energy, a great stimulus will be given to industrial development. The whole of the Kafue output or that of an initial Kariba scheme of the same capacity, could be absorbed as soon as it became available and it may be predicted that before many years the full output of both schemes will be required. One may look forward to a time when the whole of Central Africa is served by an electrical grid supplied mainly by the vast water power resources of the Zambesi Basin. Hand in hand with this, one may expect to see extensive irrigation based on the flow of the rivers regulated for power.

Central Africa with its great mineral wealth and agricultural resources may look forward to a prosperous future to which engineering activities, and particularly hydro-electric development, form the main key.

DISCUSSION

SIR SELWYN SELWYN-CLARKE, K.B.E., C.M.G. (Chairman, Commonwealth Committee): I listened with very great interest to Sir William Halcrow's most thought-provoking address and I should like to put one question to him. He puzzled me by mentioning the fact that—I think I am right in saying—the Victoria Falls could supply a power potential of 190,000 kW., whereas the Kafue Dam, taking the figure for the dry weather flow, would produce a power potential of just over 200,000 kW.

Now, I have not been to the Victoria Falls since 1935 but I do remember that a start had been made in the development of power there, and I wondered whether Sir William could tell us why, with that mass of water pouring down not too far away from Salisbury and other potential places of industrial development in Southern Rhodesia, it is not a possible site for development in place of or in addition to the Kariba and the Kafue projects.

THE LECTURER: The Victoria Falls are in a difficult situation for power purposes and practically all work would have to be done underground in tunnel. Without

entering into detail, I am certain that the answer would be that the cost of power would be greater than from Kafue.

MR. K. H. TUSON: Perhaps I may be allowed to enlarge on the development for hydro-electric power of the Zambesi, in particular at the Victoria Falls. I returned last week from a visit to the Falls where I was investigating this very matter. The existing power station is now in the process of extension to a capacity of 8,000 kW., which is the limit of the present site. There is, however, available in the Fifth Gorge a further site which can be very cheaply developed for an output of 20,000 or 30,000 kW., at a cost not exceeding £60 per kW. at to-day's prices. No rock tunnelling is involved and the works would be entirely out of sight from the Falls themselves. To develop 20,000 kW. would however, as is stated in Sir William's paper, require about one-tenth of the dry weather flow, which I think is the maximum that would be permitted. To develop 190,000 kW, which would dry up the Falls for several weeks every year, would certainly not be permitted.

Sir William says that there is no possibility of providing storage above the Falls until you get to a spot called Katima Molilo. This is true, and to build a dam at this point is rather on a par with the proposals to regulate the flow in the Kafue by storage at Meshi Teshi. There is a site some thirty miles above the Victoria Falls known as Katombora, where there are rapids with a drop of some 30 or 40 feet. There is a sketchy proposal to use this head to develop power and use it to pump water for the irrigation of Southern Rhodesia. This is not a very serious suggestion, but there is no doubt that a small amount of power of up to 30,000 kW. or so could be generated very cheaply at the Falls. Existing road and rail communications are good but the difficulty is that the load in the area does not at the moment justify such development and the distances to the load centres in the Copper Belt and elsewhere are much greater than they are from Kafue.

THE CHAIRMAN: I might add to those remarks by saying that there is a very zealous authority at Livingstone which intends to take every possible step to prevent the Victoria Falls being commercialized with anything in the way of obtrusive works; the present power station, of course, is tucked very neatly down one of the gorges. This authority has recently been given a statutory backing and it intends to preserve the Victoria Falls as a tourist attraction and one of the most attractive falls in the world.

MR. JOHN F. SHIPLEY: I have been a consultant to the Nigerian Electricity Supply Corporation for twenty-five years, though the corporation has not been operated under that name for so long. In Nigeria we have experienced exactly the same conditions of expansion that Sir William Halcrow has mentioned. Our supply is intended mainly for mining purposes; we are dealing with tin and copper. The consumption of electricity has gone up gradually, until now we are almost at the limit of our supply. In other words, unless we develop more storage—and water storage is the problem in hydro-electric work—we will have to go over to some such fuel as coal or oil. One of the difficulties that we have met with is that the gorge in which we propose to have water storage contains mineral deposits on its floor, and it will become a problem whether the company owning these deposits will work them out quickly or sacrifice them altogether for more hydro-electric power. Without this storage it will be very difficult to obtain more power.

MR. FRANK GORDON: In his concluding remarks Sir William mentioned the subject of irrigation. I should like to ask him if any thought has been given to the development of any irrigation schemes below Kariba or Kafue, or will all the water used for the creation of power be lost to irrigation—that is, if there is not sufficient fall between the discharge at the power plant and the river?

THE LECTURER: That subject has been gone into. The raising of the water

in the Zambesi river by 400 feet means that there would remain another 200 feet to reach an area of land which could be cultivated. It has been proposed that a proportion of the power from the Kariba power station should be used to pump the water from the main reservoir to the land above.

MR. F. NEWHOUSE: I should like to ask what species of crop could be irrigated at a profit by pumping 200 feet. I do not know what crop, with power at even 0·2 of a penny per unit, could make that pay.

THE LECTURER: If my recollection is correct, I think the proposal in Southern Rhodesia was an irrigation scheme for growing sugar. I do not know if that is a crop which could bear the cost of pumped water.

MR. FRANK GORDON: I submit, that the scheme as a whole should be investigated also from the point of view of irrigation before the water is lost. One talks of pumping water for irrigation, but, as Sir William has already said, the cost of pumped water is not really comparable with that of stored water in the long run. If a scheme is, shall we say, well designed, one will get stored water for the power, and perhaps lower down the valley, by means of a pick-up weir, canals can take off without there being any necessity to pump.

THE CHAIRMAN: If no one wishes to raise any further questions, I think you would like me to express our warm appreciation of the address that Sir William has given us this evening. The large audience here is an indication not only of the fact that Sir William was delivering this address, but also of the interest of so many people in this particular subject. I am sorry myself, having partaken in many arguments, 'Kariba *versus* Kafue', that no one has become really aggressively argumentative to-day! I do not feel altogether at home in this peaceful company when those two names are mentioned. As Sir William has stated, there can be no doubt that sooner or later both schemes will be necessary, but I, who once argued hotly in favour of the Kafue and persuaded the late Government of Southern Rhodesia that the Kafue scheme should come first, still feel that unless very good arguments are put to the contrary the Kafue scheme should come first.

Sir William mentioned the question of the Copper Belt and its power. He mentioned that that power is now coming from the Belgian Congo. The Congo power will be coming quite shortly—at the end of 1955 or the beginning of 1956—in a very limited amount, and that power will not serve the full needs of the Copper Belt in 1960, which will really be the crucial year when the Copper Belt will either go short of power or will have to spend a large amount of money on steam plant. The chief advocate for the Kafue scheme in Southern Rhodesia was the late Minister for Finance, Mr. Whitehead, and it was he indeed who succeeded in convincing the Cabinet of Southern Rhodesia that from the Southern Rhodesian point of view there was a great deal to be said for the Kafue coming along first.

I noticed in a newspaper the other day that the latest figure for power production on the Kafue is 375,000 kW. of power. Where that figure came from I do not know. Sir William has mentioned the figure of 257,000 kW., and that is the figure in the report of the panel, but—there is no doubt about it—we shall have in Central Africa, as Sir William has pointed out, the need (indeed, it exists there already) of a great amount of power, and it will give a tremendous incentive to the new industries that are coming along in increasing numbers every day if power can be obtained from hydro-electric sources at the sort of cost that Sir William mentioned to-night.

We are indeed grateful to him for giving us such a comprehensive address on this subject and I am sure you would wish me on your behalf, as I have said, to express our warm appreciation to him for the very informative address that he has given us.

The vote of thanks was carried with acclamation; and, another having been accorded to the Chairman, the meeting ended.

THE SOCIETY'S HOUSE: AN ARCHITECTURAL STUDY

The Peter Le Neve Foster Lecture by

JOHN SUMMERSON, C.B.E., F.S.A., A.R.I.B.A.,

Curator, Sir John Soane's Museum, delivered on Wednesday, 12th May, 1954, with Professor A. E. Richardson, R.A., F.R.I.B.A., a Member of Council, in the Chair

THE CHAIRMAN: My first duty this afternoon is to welcome new Fellows. I understand there are one or two here; therefore, in the name of the Society, I give them a very hearty welcome.

The lecture we are to enjoy commemorates Peter Le Neve Foster, who was Secretary between the years 1852 and 1879, a very eventful period in the history of English art and science. A more appropriate subject than the one this afternoon, 'The Society's House', could not have been found, especially for the Bicentenary year. We are to be re-introduced to the very atmosphere of the eighteenth century, looking back into the past and intent on the future. So equipped we shall be better able to understand the meaning and the purpose of this great Society and the part it has played in the story of England.

I will now call on my friend Mr. John Summerson to deliver his lecture.

The following lecture, which was illustrated with lantern slides, was then delivered:

THE LECTURE

The history of the Society's premises was fully treated by the late Sir Henry Trueman Wood[1] in 1913 and again in further detail by the late Arthur T. Bolton[2] in 1922. On matters of historic fact there is nothing to add to what these authors have given us. Nevertheless, when I was asked to prepare a paper in connection with the Society's Bicentenary celebrations it seemed to me that there were still at least two aspects of the building worth investigating. First, the position which the house occupies in English architectural history as the first headquarters of a learned or philanthropic society to be built strictly for that purpose and designed to express that purpose. Second, the position which it occupies as an architectural conception of the Adam brothers related in a particular way to the work of a previous generation. It is these two aspects which I propose to discuss here.

The Society took the first steps towards the erection of a building of its own in 1759 when a warehouse, northward of the Strand, was either wholly rebuilt or substantially altered for them, their architect being William Chambers.[3] There appear to be no records of this building, but as it was hemmed in on all sides by other buildings it cannot have been of much architectural consequence

externally, while the plan would have been dictated by exigencies of the site and, probably, the shape of the old warehouse.

In 1770, the lease of this building having nearly expired, the Society inserted advertisements in the papers inviting proposals for the accommodation of the Society. The brothers Adam, who were just then developing the site of Durham House as the Adelphi, replied with an offer. After prolonged discussion as to ground-rents and premiums an agreement was reached and in 1772 the foundation-stone of this building was laid by Lord Romney. The Society entered into possession two years later, in 1774.[4]

This was a building expressly built for a private society of a particular kind. There was no other society like it in England but there were various ideas in circulation which, when it came to the designing of a building, got mixed up with the central idea for which the Society of Arts stood. The actual physical needs of the Society's working life did, of course, dominate the situation, but we find that even these are poured into a mould which seems to be of earlier origin, while the architectural expression of the building—particularly the famous façade—brings into prominence a theme of very complex and interesting associations.

Let us consider first the plan and general arrangement of the building. H. B. Wheatley, a former Secretary of the Society, once drew an analogy[5] between the foundation of the Royal Society at the time of the Restoration and the foundation of the Society of Arts nearly a century later, stressing the idea that the founders of the latter 'made an entirely new departure and were strictly original in their scheme'. This, I think, with due respect to Wheatley, is not quite true. The endeavours of the Royal Society, at least in its early days, were remarkably close to those of this Society; its ultimate aim was the Baconian one of improving man's condition by the application of experimental philosophy to the affairs of ordinary life. Where the Society of Arts differed from the Royal Society was in its adoption of the principle of encouragement by award rather than by actual research. It was in fact, fundamentally, a philanthropic rather than a scientific body: its members supported its aims by subscriptions rather than by the contribution of papers or learned discussion. Nevertheless, the Society of Arts unquestionably inherited and cultivated ideas which the early fathers of the Royal Society had originally proposed for their own but abandoned in the increasingly academic atmosphere which prevailed during and after Newton's presidency. There were actually attempts, in 1721 and again in 1738, to induce the Royal Society to raise funds 'for the encouragement of Arts and Sciences'. They came to nothing but the sense of obligation was there.[6]

Now, the Royal Society had never had a building purposely designed for it; at the time of the foundation of the Society of Arts it occupied a house at the end of Crane Court, Fleet Street, with additions thrown out at the back. Nevertheless, the Royal Society had a model design for premises in its archives, prepared by no less an architect than Wren. The design itself is lost but we have the notes which Wren drew up for discussion with the Duke of Norfolk and

sent to Oldenburg, the Secretary of the Society, in 1668. They read remarkably like a preliminary notion of the building we are now in.[7]

The ground floor was to comprise 'a vestibule . . . a fair room for a Library and repository which may well be one roome . . . or, if you will divide the room with pillars, it will be better to support the floor of the great roome above it. . . . Upon the same [ground] floor is a parlour for the housekeeper, and from the Vestibule the great staires leades you up to the ante chamber of the great Roome and noe higher.[8] The great Roome for the meeting is . . . two stories high, divided from the Ante-chamber by a Skreen between Columnes. . . . Upon the same floor is the Councill Roome and a little closet for the Secretary. In the third [i.e. the second] story is two Chambers with closets for the Curators, and back staires by them, which lead from the bottom to the top'.

The Repository on the ground floor with pillars supporting the high Great Room above it, the main and back stairs, the placing of housekeeper's and council rooms—all this forecasts with wonderful accuracy the Adam building of this Society one hundred and four years later! As Wren's letter was and is in the Royal Society archives it is, I suppose, just conceivable that Adam was acquainted with it, for he was himself a Fellow of the Society. Many prominent members of this Society were also Fellows. It is also possible that the Crane Court house embodied an approximation of the Wren plan. In any case, it seems to me probable that the general arrangement has a Royal Society origin and that the germ of it filtered through the years until finally crystallized, consciously or unconsciously, in the first building of this kind to be expressly designed—a building which would have suited Wren's Royal Society just as well as it eventually suited Shipley's Society of Arts.

So much for one of the floating ideas which got embodied in this building. Another idea which crystallized here for the first time was that of a building expressing in its architecture the character of an Academy of Art. You may say that, whatever this Society was in its origin, it was not academic. That is perfectly true; and yet a society which consisted of disinterested noblemen and gentlemen anxious to foster the arts—not excluding painting, sculpture and architecture—certainly had an academic facet. And the idea of an Academy of Arts, housed in a building of appropriate classical dignity, was one of the favourite ideas under discussion at the period with which we are dealing. A building such as the one proposed in 1770 by the Society of Arts could hardly fail to bring this idea into relief in its architect's mind and be modified accordingly.

The proud and effective Academies of France, founded under Colbert and Louis XIV, had long given rise to a sense of inadequacy where English art was concerned; and in the first half of the eighteenth century the matter was raised with increasing frequency.[9] The third Earl of Shaftesbury, in 1712, proposed the idea[10] in a spirit of Whig patriotism which was not lost on the younger generation of noblemen who were making the Grand Tour in the seventeen-twenties and 'thirties. It was a group of those young men who founded, in 1732, the Society of Dilettanti.[11] This was what we might call (though its founders did not) a dining-club—a bibulous and extravagant affair with mock-serious

ceremonies (a toga for the chairman was one of its properties) and an interest in antiquity of a rather desultory and light-hearted kind. Nevertheless, the interest was real in its way and the members of the Society were not impecunious. In 1743 they decided to build themselves a house. They acquired a site on the north side of Cavendish Square, where the Duke of Chandos had once proposed a mansion for himself. In 1751 a design was made by John Vardy.[12] This, however, was abandoned and in 1753 the Society agreed that, to avoid controversy, their house should take the external form of the Temple at Pola, in Istria, which two of their members, James Stuart and Nicholas Revett, had visited and drawn.

Meanwhile, however, another issue had arisen. The Society had become intrigued by the idea of founding and building an Academy of Arts. One of its members, a Mr. Dingley, had laid a scheme before them in 1749. Nothing came of it, but in 1755 a paper was submitted by a Mr. Francis Milner Newton,[13] the secretary of a committee of artists who were anxious to promote the foundation of an Academy. For a time there was a possibility of the patrician Dilettanti and the bourgeois artists joining forces in the creation of an Academy. But the patricians proved too exacting and the bourgeois too proud, and the scheme had been dropped before the year was out. Nevertheless, this project probably provided the incentive for a remarkable plan for a building on the Cavendish Square site, comprising a 'Grand Council Room' with porticos to north and south, flanked by wings designated 'Academy for Architecture' and 'Academy for Painting and Sculpture'. This plan is preserved at West Wycombe, and I have to thank Mr. Howard Colvin for bringing it to my notice. The authorship of the plan is obscure and it is undated, but it is a fair inference that it emanates from the architectural circle of the Dilettanti Society which included Colonel (later Major-General) George Gray (with Vardy as his architect) and the two professional architect members of the Society, James Stuart and Nicholas Revett. The date may be assumed to be around 1755, when the idea of the joint Academy was being debated and when, incidentally, Henry Cheere, the sculptor, brought before this Society a 'Plan for the Founding of an Academy', and when, moreover, the Society considered offering a prize for a plan, though they did not proceed to do so.[14]

Now all this may seem extremely remote from the subject in hand, the more so when I tell you that by April, 1756, the Dilettanti Society abandoned all idea of building either an academy or a house for themselves. It is not clear with which plan they were proceeding, but whatever it was it was stopped.

The real importance, for us, of the Dilettanti group is not so much in their various projects, none of which got any further than paper, as in the influence they brought, individually, to bear on the introduction of a new and highly architectural type of London house-front—the house-front which was masked, as to its upper storeys, by columns in the round, supporting a pediment—like the front of a Roman temple. The first exposition of this theme was in Lord Spencer's house, which still exists, fronting the Green Park (Fig. 2). Lord Spencer was a member of the Dilettanti. It was begun in 1756, the nominal designer

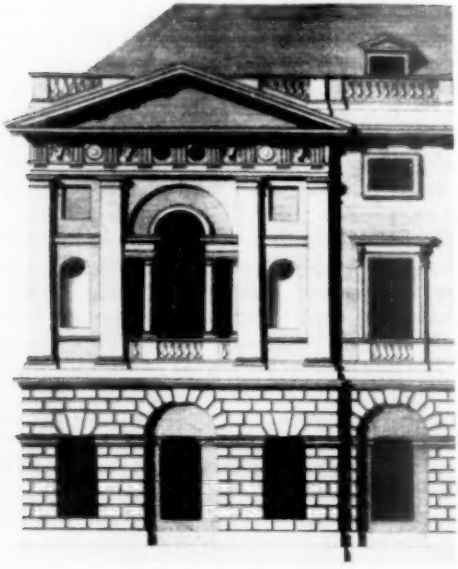


FIGURE 1. (left)
Part of the north elevation of Spencer House; from Vitruvius Britannicus

FIGURE 2. (top right)
Spencer House: the Park front
(Copyright: Country Life)

FIGURE 3. (bottom right)
Nos. 11–14 Cavendish Square
(Copyright: National Buildings Record)

being General Gray, who seems to have been the leader of the Dilettanti in all architectural matters; the executant architect was John Vardy who, as we have seen, had prepared in 1751 (no doubt under Gray's supervision) a design for the Dilettanti house on the site in Cavendish Square. Spencer House has a six-column portico in the round on the Park front and, on the front to St. James's Place, two slightly projecting pavilions[15] with four pilasters each of which provide, incidentally, the germ or rather more than the germ—of the Adam façade in the Adelphi which is our object of study. To this relationship I shall refer again; for the moment let us pursue the story of the parties.

The next façades of this kind are to be found—and this may be sheer coincidence—on the very site which the Dilettanti had vacated, in 1756, on the north side of Cavendish Square (Fig. 3). Now, is this coincidence or is it not? We know that before 1756 £200 worth of Portland Stone had been purchased, foundations dug, and a screen wall, designed by General Gray, erected. Then the site was sold. There follows an interval of thirteen years during which the site remained vacant. Then, in 1769–70 two pairs of houses arose upon it with magnificent Corinthian porticos, much in the style of General Gray and John Vardy as seen in Spencer House.[16] Yet these houses are nothing much internally and in any case were built simply as an investment by a Mr. George Forster Tufnell,[17] who lived in one himself. One does not lavish Corinthian

fronts on speculative houses—unless, indeed, the material for them lies to hand and can be had cheap. I cannot help wondering if Tufnell, in acquiring the Dilettanti site had not also acquired that £200 worth of Dilettanti stone and, moreover, if a great deal of that stone had not already been cut and prepared for erection. That would explain not only the anomaly of costly fronts to ordinary houses but their wholly anachronistic style (for 1769–70). We do not know who Tufnell's architect was, but we do know that in 1771 James Stuart, the celebrated architect who was also a Dilettante, published an anonymous pamphlet[18] in which he singles out this pair of house-fronts and one other front, designed by himself as being the most distinguished of their kind in London. Stuart would have known all about the Dilettanti stones; did he perhaps help Mr. Tufnell to adapt them to a new purpose? I cannot see Stuart deliberately advertising the merits of houses which were not designed either by himself or under circumstances with which he was intimately associated.

If there is anything in this speculation, it means that the porticos of Cavendish Square (which now so felicitously frame a splendid sculpture by Sir Jacob Epstein) were, very possibly, in origin the two porticos of the Academy building which never got built.[19] When I suggest them, in their ultimate situations, as obvious prototypes of our Adam front here you will at once see the merit—or, at least, the ingenuity—of the discursive sweep through which I have led you.

The other house which Stuart praises in his pamphlet—the house designed by him for yet another member of the Dilettanti, Admiral Lord Anson, at 15 St. James's Square, building in 1763 but still incomplete in 1771—is also germane to our purpose (Fig. 4). Here again we have four columns in the round, supporting a pediment; and here we have Stuart introducing, for the first time in London, the Greek ornaments which he and Nicholas Revett had measured in Athens and which they had, in part, published in the first volume of their *Antiquities of Athens* (1762). Neither Robert nor James Adam ever went to Greece but the fascination of the newly discovered Greek Ionic was not lost on them, as you can see by comparing the volutes of the columns on this building with those of the house in St. James's Square.

But that is merely incidental. What I have been trying to give you is the background of contemporary architectural events against which the Adams designed the façade of this building. I did not realize, when I started this paper, to what an extent this type of façade was bound up with the architectural ideas of the Society of Dilettanti. But that seems to be where it originates. It is a neo-classical idea—this framing up of a façade in the manner of a temple front on a high podium. I do not want to exaggerate its novelty. The pilastered front of Middle Temple Gateway is, if you like, a prototype; and in Queen Square, Bath, a portico was placed as the centre-piece of a row of houses as early as 1729. But I submit that there is a shade of difference in both cases. Middle Temple Gateway is in the tradition of ornamental gatehouses and the portico idea is more or less accidental; at Queen Square the architect was thinking in terms of a centre-and-wings composition in the manner of the Louvre. The Dilettanti type of London house-front is a more puristic conception emanating from

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FIGURE 4. *No. 15 St. James's Square*

minds which were steeped in the idea of a house as a temple, an idea which is strictly neo-classical.

And now, having plucked out and exhibited some of the ideas which lay ready to the architects' hands, let us come to the architects themselves—Robert and James Adam. In 1770, when they answered the advertisement in the press with the offer of an Adelphi site, Robert was 42, James 40. James, in this instance,

carried on the business side, while the engraved design is signed by both Robert and James. The first sketch for the façade[20] seems to be, however, in Robert's hand (Fig. 5).

In 1770 the brothers had already accomplished a great deal of work—their decorative installations at Bowood, Kedleston, Osterley, Syon, Harewood, their rebuildings at Luton and Kenwood; in London, the Admiralty Screen and Shelburne House, and the beginning of the Adelphi. Their style was perfectly mature and they were conscious of the revolution they had effected in English architecture. This is not the place to go in any detail into the nature of the Adam style, but I will just summarize those aspects of it which we shall see reflected in this building. First, then, in composition the Adams based themselves almost entirely on the school of English architecture which had flourished in their earlier years—the Palladianism of Burlington and Kent, and incidentally of Vardy, their follower. The *staccato* movement, as it has been called,[21] of Burlington is evident in nearly all Robert Adam's work; he never replaced this, as Chambers did, by a broader sense of composition. So much in Adam was conservative, by instinct and by choice. But then there is the revolutionary aspect. His travels, his reading and his acquaintance with Piranesi had induced him to take a wholly new view of antiquity as a source of design. By-passing the authoritarianism of Vitruvius, Serlio, Palladio and the rest he discovered that Roman design, far from being a matter of strict rules was, on the contrary, a matter of complete freedom within the ambit of certain traditional themes. Far from there being one or two or three 'correct' Corinthian orders there were literally dozens of Corinthian orders to be found if only one took the trouble to search further than the conventional Roman ruins—in Dalmatia, as he himself had done, in Syria and Greece, as Robert Wood and Stuart had done. And finally he discovered that Roman temple architecture was one thing and the decoration of Roman houses and tombs quite another. In short he found for himself a new freedom, sanctioned by the authority of a Rome more closely observed and historically appreciated than it had ever been before.

In the John Adam Street elevation of this house we find all this most beautifully epitomized. I have already drawn attention to one obvious Palladian prototype of the composition as a whole—the pavilions on John Vardy's north front of Spencer House. These, in turn, derive from the centre pavilion of Kent's Treasury in Horse Guards Parade and that is closely related to the pavilions in one of Inigo Jones's designs for Whitehall Palace;[22] the main common factor in all these designs being the type of Venetian window which in Adam's façade here becomes so very important, the type in which a relieving arch, concentric with the arch of the centre light, is turned over the whole trio, producing a recessed area of masonry between the two semi-circles. This type of window was taken by Inigo Jones from some pseudo-Palladian drawings which he acquired.[23] Burlington was the first to give it great importance, in the garden front of his Chiswick villa. After that, it played an important part in English design up to the Regency.

To the Adams' detailed treatment of this theme I shall return in a moment.

(Copyright: Soane Museum

FIGURE 5. *The Society of Arts: a preliminary sketch by Robert Adam (at Sir John Soane's Museum)*

The composition as a whole seems to me to be in the line of those London houses which Stuart praised—the two in Cavendish Square and, more especially, his own house for Lord Anson in St. James's Square. In those houses the 'Academy' notion is implicit; in the Adams' façade it is rendered explicit by a broader, more monumental treatment and, more obviously, by the placing of an inscribed tablet in the frieze.

The proportions of the façade derive largely from the plan of the structure behind it. Indeed, there is a most felicitous unity in the whole, probably instinctive rather than conscious. The main elements in the plan are (*a*) the two big rooms, both nearly square, the Repository (now the library) below and the Great Room above, and (*b*) the two little rooms, again nearly square,

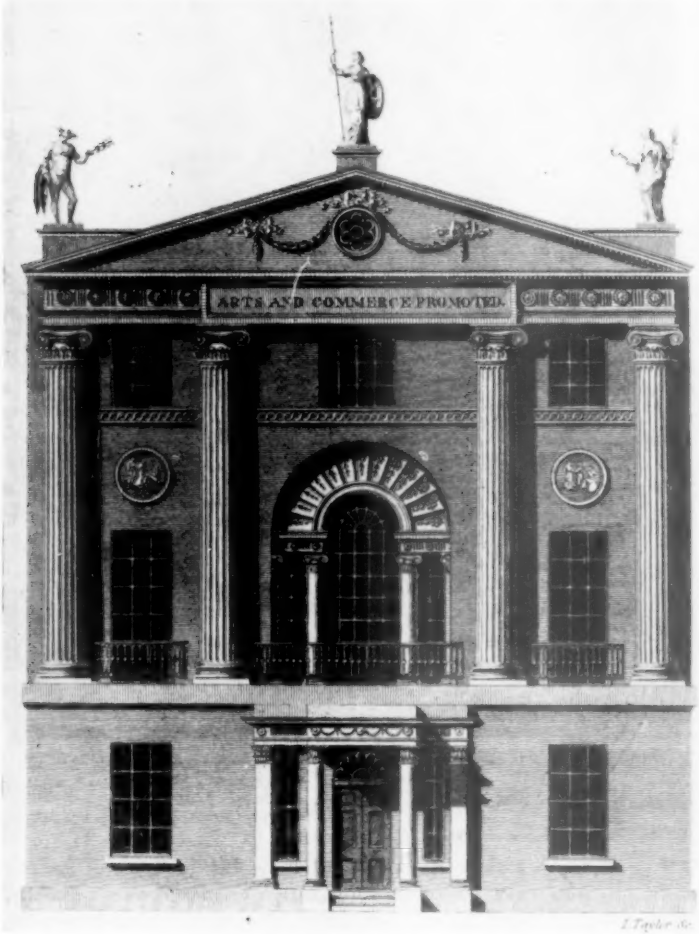

FIGURE 6. *The Society's House*

the Vestibule below and the ante-room above. This gives birth to the idea of two orders—a principal and a subsidiary order—and, to be sure, there are two orders in the facade. The principal order is roughly in line with the pairs of columns dividing the Repository; and the subsidiary order supplies the necessary verticals in the openings to the vestibule below and the ante-room

Nicchia della facciata Sepolcrale al num.° 4. della pianta
nella Villa Corsina Ornata di stucchi, e Pittura da Ecc.te mano
d'artefice
1. e 2. Modolatura delle cornici di stucco

Author's copyright

FIGURE 7. *Roman tomb in the grounds of Villa Corsini; from Pietro Santi Bartoli*, Gli Antichi Sepolchri, *1768*

above. A charming example of the logical functioning of a thoroughly architectural mind.

The Adams' principal order is of considerable interest. It was one of their new established beliefs[21] that 'the proportions of columns depend on their situation', and here we see this belief being applied. This order is completely

original; it is to be found in no book and has, as a totality, no antique precedent. It is an order designed for this situation and no other. Whereas the Corinthian orders of Spencer House or the houses in Cavendish Square are coldly and bookishly Doric and Corinthian, derived in every detail from antique precedent, the Adams' order is a Composite of their own invention, a cross between Corinthian and Ionic with an entablature much smaller and with less projection than any of the text-books would allow, and with a frieze whose alternating flutes and shields make a witty allusion to the Doric. I have said that, as a totality, it has no antique precedent; antiquity has, nevertheless, been raided for some of the details which give it its peculiar effect. A capital resembling the type used here Robert Adam had himself found and measured in Diocletian's Palace at Spalatro,[25] but he has merged it with another exotic discovery—the Ionic of the Erectheum at Athens, measured by Stuart and Revett, and already used by Stuart in St. James's Square but published as yet only by Le Roy.[26] An order very much on these lines Robert Adam had lately used in the entrance front of Kenwood. But there it is a giant order rising from the ground; as one would expect, therefore, the proportions are very different from the raised order at the Adelphi.

Nothing strikes the visitor to this building more agreeably than the great Venetian window (Fig. 6) which is the focal element in the façade. As I have already shown, this type of window had become a characteristic English feature before the Adams' time. But they have made of it something quite new and fresh by a very simple device—the radial fluting of the space between the inner and the outer arch. This device is, so far as I know, the Adams' own invention, though inspired by what they found in that antique type of house and tomb decoration to which they gave special attention in their Roman studies. The shell niche was not uncommon in Roman antiquity either in the solid or in painted decoration. The radial motif with the scalloped edge, abstracted from the shell idea, is found both in antiquity and in Italian decorative work of the sixteenth century; there is just a hint of it in Raphael's Vatican frescoes. The Adams used it constantly in their ceiling decorations and elsewhere: the original 'fan' design of fan-lights is, I imagine, one derivative of it. But our window here is, so far as I know, the first occasion where the radial shell theme is allied to what one must call the Anglo-Palladian type of Venetian window.

It would be idle to look for the Adams' source where so familiar a theme is concerned, were it not that the enrichments in the flutings here point rather obviously to an engraving of the shell decorations in a tomb at the Villa Corsini in Rome (Fig. 7), given by Bartoli in a book which Adam certainly possessed.[27] The gay facility with which the Adams have seized on the essential character of this antique example and adapted it to wholly new circumstances needs no comment.

Finally, a word about the porch. The publication, in 1762, of Stuart and Revett's reconstruction of the Tower of the Winds at Athens provided English architects with a new idea of a small classical porch. Here the Adams use it without its pediment and in combination with the Venetian three-light motif

descending from the window above. Shields, swags and flutes punctuate and adorn the frieze in the characteristically lively Adam way. Again, we have the new freedom from convention combined with the keenest appreciation of everything which archæology could extract from the ancient world.

This building as a whole occupies a special place among the Adams' works. It is one of their few public buildings, and proved one of the least controversial at the time when the Adam manner was going out of fashion.[28] It was certainly influential. Crunden plagiarized the façade extensively in his design for Boodles Club; and the porch was an innovation which reached far into the years ahead. If the Society of Arts had given nothing else to English life than this building, it would still be remembered with kindness. Rarely indeed, in the past two centuries, have good works issued from so excellent a home.

REFERENCES

1. *The History of the Royal Society of Arts*, 1913.
2. *The Architecture of R. and J. Adam*, 1922. Vol. II, pp. 40–47.
3. Wood, *as above*, pp. 54–55.
4. Bolton, *as above*.
5. Quoted in Wood, p. 27.
6. Sir H. Lyons, *The Royal Society, 1660–1940*, 1944, pp. 154 and 182.
7. Wren Soc., Vol. XIII, pp. 48–49.
8. The stair in the R.S.A. building did originally go higher and in this respect modern alteration has brought the building closer to Wren's description than it originally was.
9. N. Pevsner, *Academies of Art Past and Present*, 1940, p. 124, etc.
10. *A Letter Concerning the Art or Science of Design*, 1712.
11. L. Cust and S. Colvin, *History of the Society of Dilettanti*, 1914. This is the source for all references to the Society in this paper.
12. Exhibited in the Society of Artists' Exhibition, 1761. '225. A design for a building for the society of the Delitanti, anno 1751'. The design does not seem to have survived.
13. The portrait painter, who became Secretary of the Royal Academy on its foundation in 1768.
14. Cheere's 'Plan' is in this Society's archives. The proposal to offer a prize is recorded in the Minutes.
15. Only one was executed. The complete design is given in *Vitruvius Britannicus*, Vol. IV, pl. 38.
16. The St. Marylebone Rate-books enter the houses in 1769 and note them as 'covered in' in the following years.
17. E. Bertha Tufnell, *The Family of Tufnell*, privately printed, 1924. G. F. Tufnell (1722–98) was M.P. for Beverley, a Colonel in the Militia and a member of the Society of Arts.
18. *Critical Observations on the Buildings and Improvements in London*.
19. The columns in the West Wycombe plan are the correct diameter but the wrong inter-columniation. The plan, however, was not necessarily final. It is worth noting that the columns in Cavendish Square are not bounded into the walls.
20. In Sir John Soane's Museum, Adam Coll., Vol. X, No. 86.
21. R. Wittkower, *Lord Burlington and William Kent*, in Archæological Jnl., CII, 1945.
22. As published in W. Kent, *Designs of Inigo Jones*, 1727.
23. R. Wittkower, *Pseudo-Palladian Elements in English Neo-Classical Architecture*, in the Journal of the Warburg and Courtauld Institutes, Vol. VI, 1943.
24. R. and J. Adam, *Works in Architecture*, Vol. I, No. 2, 1774, p. 4.
25. R. Adam, *The Ruins of the Palace of Diocletian*, 1764.
26. Leroy, *Les Ruines des Plus Beaux Monuments de la Grèce*, 1758, pl. 20.
27. Pietro Santi Bartoli, *Gli Antichi Sepolcri*, 1768, pl. 8.
28. See for instance the encomium in the text of Malton's *Picturesque Tour*, 1792, quoted in Bolton, as above, p. 46: 'This building alone demonstrates that the Messrs. Adam were completely sensible of the beauty and grandeur resulting from simplicity of composition and boldness of projection. I know of no fabric in London of similar dimensions, that can rival this structure in these characteristics.'

THE CHAIRMAN: This Society was founded at a time when the first British Empire became permanent, an event epitomized in the paintings by Barry which adorn the walls of this hall. We have a building that has survived the great period of the second British Empire and now graces the period of the British Commonwealth. It is wonderful to think that this building recalls momentous events and that it has survived intact. In the process the lighting has changed, thanks to the intervention of science, from candles, which at one time lit the deliberations of members of the public, to gas lighting and recently to electrically lit chandeliers.

Buildings and institutions flourish by the spirit of their foundation; if they are well established they continue. It is the same with architecture and the arts. It was indeed an inspiration of the first rank to inaugurate a society for the promotion of art and commerce at a time when the first British Empire was in process of formation.

Regarding the architecture of this building, we have to thank the architects from Scotland who gave us their austere version of the Palladian manner besides designs

for furniture, carpets and silver. The Brothers Adam were the promoters of a middle-class style in England. Everybody of taste had a choice, either a house front or a good fireplace. The simplest furniture had style.

The only vulgarity I see in this hall is the panelling of the walls, added some twenty-five years ago. I should like to see this panelling removed; it is, indeed, bad Adam. The excellence of the works of the Adams, as Mr. Summerson has shown, was due to the fact that they were influenced by engravings. Some quality of the engravings was translated into the architecture. It was the observance of contemporary drawings and of engravings that gave quality to the architecture. Alas, we have few engravers now. The cross-reference to books and engravings on the part of old architects is most interesting. I have noticed it especially in French architecture and I have observed the effects in the English work of the eighteenth century.

Mr. Summerson, unlike some lecturers, has taken us into the very spirit of the past; he has given us facts which are illuminating. He has shown us the value of sequence, of evolution, of continuity and of advantageous change. He has shown us that we must have a basis for whatever we create. The chief merit of this lecture is that it has been to the point. There was not a superfluous word in it.

I feel on this very pleasant spring afternoon that, faced with new prospects, there is indeed fresh hope for this great country. This third British Empire, now a great Commonwealth of nations, inspires hope. We have to look for a renewal of the arts in which experience will be blended with adventure. I hope this will be the way the future will develop.

I thank all who have attended this afternoon and invite a hearty vote of thanks to Mr. John Summerson.

The vote of thanks was carried with acclamation, and the meeting then ended.

GENERAL NOTES

THE ARTS AND CRAFTS OF THE BRITISH COLUMBIA INDIANS

No art student, to whatever school attached, who can manage to visit the Imperial Institute before the end of December should miss seeing the exhibition of Sir Alfred Bossom's collection of the art of the British Columbia Indians—an exotic experience which some of them may find hardly less exciting than the great Mexican exhibition at the Tate Gallery last year. As Henry Moore said, when reviewing in *Man* (July, 1951, Article 165) the exhibition of Traditional Art from the Colonies in another part of the Imperial Institute: 'Nowadays artists have a greater opportunity than ever before of studying all the great traditions in the history of art, and working their way through them until they find their own style; at first they may imitate Picasso, or primitive art, or the painters of the Renaissance, but eventually, if they have it in them, they will find their own way'. It is arguable, no doubt, that this eclectic approach, which is with us whether we like it or not, brings more harm than good, that the most admired periods of the world's past (Archaic as much as Classical Greek) could hardly have achieved such artistic concentration and intensity if their young artists had been subjected to such an extraordinary range of differing and conflicting influences. The numbers of art students and artists have become so enormous (partly no doubt because of the attraction of these varied interests) that the amount and indeed the proportion of derivative work being produced must be greater than ever before; nor can we be sure that the spark of genius is always unerringly recognized by critics and public. Yet on the whole we must assume that the great artists continue to overcome the shackles or lack of shackles of their culture, as the case may be; and eclectic studies, under the right teachers, should, ideally, lead to a fuller and quicker apprehension of the fundamentals of æsthetics.

'Primitive' or tribal art is especially valuable for this purpose, because it is so far

removed from the norm (which is not to say the best) of the European tradition. The last vestiges of primitivity were scientifically eliminated in the 'industrial revolution' of fifth-century Greece, and though primitive qualities were an essential part of the great medieval tradition, it is the Classical and Renaissance periods which have chiefly determined the norm. By deep and perceptive study of tribal arts, we may learn (as we cannot from Picasso) the nature of the sacrifice made by art in the time of Pericles in order to fit itself for the leadership of industrial civilization. The sacrifice consisted in the renunciation of dynamism as the philosophical basis of art, as indeed of life and thought; being became a static condition instead of a process (as it remains among the world's primitive or pre-industrial peoples), and beings (including inanimate objects) became static matter capable of movement instead of actual manifestations of force or energy; for among the tribal peoples, it seems, force is not an attribute of being, but is itself being. This is not the place in which to expound or justify this theory of the difference between the tribal and the industrial traditions in art; but it is worth mentioning when recommending the Bossom exhibition to art students, because this display provides one of the best opportunities in recent years for studying primitive dynamism in full expression.

However, it is for its own sake, and not merely as a vehicle of art instruction, that the exhibition should primarily be seen and remembered, in an age when there is so much interest in exotic knowledge as an end in itself—or an escape. It is, I imagine, the largest exhibition of North-West Coast art and culture ever held in this country. The magnificent collections of the British Museum, dating back in part to Captain Cook, can be shown only in token selection for the foreseeable future, and it is a pity that the Bossom collection cannot be permanently on show at the heart of the Commonwealth, so that the diversity and unity of these cultures might be appreciated to the full. Within the rather rigid conventions which are one's first impression of this art, one soon realizes that a full range of styles is possible —just as for example in African sculpture—, from naturalism to abstraction, and including local equivalents of surrealism, such as a Tsimshian ceremonial headdress in this exhibition with a mythical monster's head surrounded by five disquieting human hands clutching at the air. The self-identification with nature of these Indians, with their totemic religion and cosmology, is one of the most obvious impressions gained from this large and spaciously arranged show; the bear, the beaver, the eagle and the whale are everywhere, in red flannel outlined in dentalium shell or shirt buttons on a black robe, or carved in wood or horn (often with greater emphasis on surface-enhancement, in which they excel, than on form, though of this too they were often masters). One of the most beautiful pieces is a miniature, an ivory peace pipe with wonderfully sculptured scenes of everyday life carved in the round; at the other end of the scale are large figures labelled 'Adam and Eve', but apparently rather representing the male and the female virtues or functions, which are good examples of naïve but successful folk art. An old hide blanket with a split whale painted in red and black is another outstanding piece. Many of the pieces are connected in some way with the famous, and essentially primitive, institution of the potlatch, or great feast at which the wealthy spread their riches among the community; for to them wealth is not coins or notes or bank balances, but expenditure.

When I visited the exhibition the labelling was not yet very far advanced. May one hope that the opprobrious designation 'Siwash' as a generic term for these Haida, Tsimshian, Tlingit, Kwakiutl, Salish and other Indians will be dropped? 'Sivash' is a Russian word meaning 'putrid', and the term is no doubt a legacy, among many others, of the Russian occupation of Alaska. However, the information given on the labels which I saw is in general valuable to an appreciation of the intentions of the artists, and for the attractive and instructive character of the exhibition the Imperial Institute and Sir Alfred Bossom are to be warmly thanked.

WILLIAM FAGG

CUSTOMS AND EXCISE ART CLUB

Over one hundred oils, water-colours and drawings are shown at the Fourth Public Exhibition of the Customs and Excise Art Club now being held at the Royal Exchange, London, E.C.2.

The Exhibition will be open from 10 a.m. to 4 p.m. (to noon on Saturday) until Wednesday, 20th October. It will be closed on Sunday. Admission is free.

NEW TECHNIQUE FOR A VILLAGE HALL

A prototype for a new kind of village hall which promises to be erected in other parts of the country has recently been built in Fordingbridge. The system of construction, for which the Reema Construction Limited is responsible, is one which has been developed by that company and applied in the many houses it has built since the war under the sponsorship of the Department of Scientific and Industrial Research. The basic material used is concrete manufactured into large precast hollow panels in which windows, doors, ventilators, electric light and plumbing requirements are embodied during manufacture. These units are transported to the various building sites and erected to form columns and beams within the structure of the panel to complete a reinforced concrete structure with unusual strength and permanence. Because of the great demand for new village halls, which has remained unsatisfied since the war on account of the high cost of brick and similar buildings and the delay to which small building schemes have been subjected, the manufacturers decided to apply the system to buildings of this character.

The hall at Fordingbridge can seat 250 people and in addition to the usual offices has a large stage and dressing rooms. It has an arched roof consisting of curved laminated wood ribs boarded outside and lined inside with fireproof insulated board and covered with ruberoid slates which are both light and durable.

Apart from its two great practical merits, cheapness and speed of construction—it is claimed that the hall can be assembled in two months and largely with unskilled and possibly voluntary labour—its appearance has been carefully designed so that it may fit in to the traditional English village for which it is intended.

THE ROYAL PHOTOGRAPHIC SOCIETY'S ANNUAL EXHIBITION

The Royal Photographic Society's Annual Exhibition is presented this year in a form which differs from those which have become traditional. Instead of covering all aspects of photography, it is confined to pictorial work in colour, monochrome and stereoscopic form, as prints and transparencies.

The Exhibition, which was officially opened by The Right Honble. The Earl of Radnor, K.C.V.O., will be on view on weekdays at 16 Princes Gate, until Saturday, 6th November, from 10 a.m. to 7 p.m., including Saturdays. Admission is free.

CÉZANNE EXHIBITION

The exhibition of paintings by Cézanne, which was organized by the Arts Council with the Royal Scottish Academy for this year's Edinburgh Festival and was discussed by Mr. Nevile Wallis in the *Journal* of 3rd September, is now being shown at the Tate Gallery and will remain there until 27th October.

The exhibition, which was one of the outstanding features of the Festival, consists of 64 paintings, seven additional works being added for London; it is representative of all stages of Cézanne's career as a painter, and is the finest collection of his pictures yet to be exhibited in this country.

The exhibition is open on weekdays from 10 a.m. to 6 p.m. (until 8 p.m. on Tuesdays and Thursdays) and on Sundays from 2 p.m. to 6 p.m. The charge for admission is one shilling.

OBITUARY

SIR RODERIC HILL

We record with regret the death of Air Chief Marshal Sir Roderic Hill, K.C.B., M.C., A.F.C.

Roderic Hill began his career as an artist with the Temple Press designing for motor cycling and aviation journals. At the outbreak of the First World War he joined the Army, and in 1916 was seconded to the Royal Flying Corps. Recalled in 1917 from France to head the experimental flying department at Farnborough, he was, in 1918, the first pilot deliberately to fly into a balloon cable, during investigations of balloon defences. In 1921 he was awarded the R.M.Groves Memorial Aeronautical Research Prize.

He served with the Royal Air Force between the wars, combining scientific knowledge with first-class skill as a pilot. In the Second World War his appointments were many and various, including that of Director-General of Research and Development in the Ministry of Aircraft Production and Commandant of the R.A.F. Staff College. In 1944 he was appointed A.O.C.-in-C. Fighter Command. He retired from the R.A.F. in 1948, and was appointed Rector of the Imperial College of Science and Technology in the same year.

He was elected a Fellow of the Society in 1950.

MR. GEORGE CADBURY

We also record with regret the death at the age of 76, of Mr. George Cadbury.

Athough George Cadbury was for 43 years Managing Director of Cadbury Bros., the family firm of chocolate manufacturers, he still had time for a multiplicity of other interests. Apart from being on the committees of many charitable institutions and serving on Birmingham City Council, he was prominent in the promotion of planned schemes of good low-priced housing. He was an authority on transport and a supporter of canal transport, which he used as much as possible in his own business. He was also a historian of no little repute and a Fellow of the Society of Antiquaries.

He was elected a Fellow of the Society in 1934.

FROM THE JOURNAL OF 1854

VOLUME II. *20th October*, 1854

From Subjects for Premiums.

The Council, in issuing the subjoined List of desiderata, would urge upon the Members of the Society generally, and others, the importance of communicating detailed accounts of new processes in the Arts or methods of Manufacture, of any new Mechanical arrangements by which these may be simplified, or labour saved, and of any novel application of Raw Materials, whether previously known or not, to useful purposes. . . .

The following are some of the desiderata:

21. For an account of the economic manufacture of Colours by Electricity.
29. For the importation of not less than half a ton of well-dried Plantains, or Bananas, from the West Indies.
32. For the best essay on the theory and practice of Fermentation, particularly as applied to the Art of Brewing; so as to modify, or altogether dispense with, the intermediate process of malting.
68. For a cheap and efficient Meter, for experimental purposes, for registering small quantities of Gas.

71. For improvements in the Ventilation of Emigrant Ships.
87. For a Conductor's Pianoforte, of limited compass, that is, of about two octaves, which might be placed near the conductor's desk, or form part of it.
90. For the successful application of some new means, (as Electricity or Photography, for instance) for producing Ornamental Designs in Woven Fabrics, which shall be cheaper and easier of application than those at present employed.
106. For the cheapest and best smoke-consuming and fuel-economising Open Grate.
118. For an essay on the best example of Modern Furniture in various materials, exhibiting sound principles of construction, in combination with decorative art.
119. For a Chair or Couch affording the greatest possible amount of support to persons of weak physical powers whilst writing.
130. For the best design for a Flower Trough or Vase, ornamented in Bas Relief, and capable of being cast from a mould in one piece, and of being produced in Terra Cotta.
133. For the best series of four Outline Drawings in illustration of Longfellow's poem, 'Building the Ship'.

Some Activities of Other Societies and Organizations

MEETINGS

SUN. 17 OCT. British Kinematograph Society, at G. B Theatre, Wardour Street, W.1. 11 a.m. L. Knopp: *The Techniques of Large Screen Presentation.*

MON. 18 OCT. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. *Electricity in the Future* (Discussion).
Geographical Society, Royal, South Kensington, S.W.7. 8.30 p.m. F. Spencer Chapman: *African Caravan.*
Imperial Institute, South Kensington, S.W.7. 5.45 p.m. J. S. Neill: *Exploring the Islands: Pitcairn.*

TUES. 19 OCT. Civil Engineers, Institution of, Great George Street, S.W.1. 5.30 p.m. F. H. Allen, W. A. Price and Sir Claude Inglis: *Model-Experiments on the Storm Surge of 1953 in the Thames Estuary and the Reduction of Future Surges.*
Industrial Transport Association, at the Royal Society of Arts, W.C.2. 6.30 p.m. D. N. Farrar: *Two-Way Radio Control of Transport Vehicles.*
Manchester Geographical Society, 16 St. Mary's Parsonage, Manchester, 3. 6.30 p.m. A. L. Roston: *Liberia.*
Petroleum, Institute of, 26 Portland Place, W.1. 6 p.m. J. Walker: *Synthetic Rubber in the Commonwealth.*

WED. 20 OCT. Eugenics Society, at the Royal Society, Burlington House, Piccadilly, W.1. 5.30 p.m. Professor S. Chandrasekhar: *Infant Mortality in India: 1901-1951 A Demographic Revolution.*
Locomotive Engineers, Institution of, at the Institution of Mechanical Engineers, 1 Birdcage Walk, S.W.1. 5.30 p.m. J. F. Thring: *The Design of Light Alloy Coaches for E. African Railways.*
Meteorological Society, Royal, 49 Cromwell Road, S.W.7. 5 p.m. (1) R. A. McCormick: *The partition and intensity of eddy energy at the 91-metre level during unstable conditions as observed at Brookhaven National Laboratory.* (2) F. J. Scrase: *Turbulence in the upper air, as shown by radar-wind and radiosonde measurements.* (3) R. F. Jones: *Five flights through a thunderstorm belt.*
Petroleum, Institute of, at the Chemical Society, Burlington House, Piccadilly, W.1. 5.30 p.m. Gustav Egloff: *Platforming.*
Victoria & Albert Museum, South Kensington, S.W.7. 6.15 p.m. Helen Lowenthal: *The English Romantic Garden.*

THURS. 21 OCT. Refrigeration, Institute of, at the Institution of Mechanical Engineers, 1 Birdcage Walk, S.W.1. 5.30 p.m. N. P. Allen: *The Properties of Metals at Low Temperatures.*
Road Transport Engineers, Institute of, at the Royal Society of Arts, W.C.2. 6.30 p.m. M. J. Knaggs: *Ball and Roller Bearings—Their Treatment and Repair.*

FRI. 22 OCT. Mechanical Engineers, Institution of, 1 Birdcage Walk, S.W.1. 5.30 p.m. H. H. Andersen: *Modern Developments in the Use of Large Single Entry Centrifugal Pumps.*

SAT. 23 OCT. Horniman Museum, London Road, Forest Hill, S.E.23. 3.30 p.m. Kenneth P. Oakley: *Piltdown Man.*

MON. 25 OCT. Electrical Engineers, Institution of, Savoy Place, W.C.2. 5.30 p.m. *Whether Compatibility is Necessary for a Colour Television System in Great Britain* (Discussion).
Imperial Institute, South Kensington, S.W.7. 5.45 p.m. Betild Bekker: *Exploring the Islands: In Borneo.*

TUES. 26 OCT. Civil Engineers, Institution of, Great George Street, S.W.1. 5.30 p.m. D. C. Milne: *The Queen Elizabeth II Dock.*
Manchester Geographical Society, 16 St. Mary's Parsonage, Manchester, 3. 6.30 p.m. G. J. Butland: *Chile's Far South.*

WED. 27 OCT. Victoria & Albert Museum, South Kensington, S.W.7. 6.15 p.m. W. G. Archer: *Romance and Poetry in Indian Painting.*

FRI. 29 OCT. Mechanical Engineers, Institution of, 1 Birdcage Walk, S.W.1. 5.30 p.m. F. Dollin: *Factors Influencing the Continuing Development of the Steam Turbine.*

SAT. 30 OCT. Horniman Museum, London Road, Forest Hill, S.E.23. 3.30 p.m. H. J. Braunholtz: *The Potter's Craft in Africa.*

OTHER ACTIVITIES

MON. 18 OCT. UNTIL SUN. 24 OCT. Imperial Institute, South Kensington, S.W.7. 12.30 p.m., 1.15 a.m. and 3 p.m. Weekdays, 3 p.m. and 4 p.m. Sats. and Suns. Films: *Living Memorial—South Africa; This is Malaya; Folk Dances of India; Arnhemland—Australia.*

MON. 25 OCT. UNTIL SUN. 31 OCT. Imperial Institute, South Kensington, S.W.7. 12.30 p.m., 1.15 p.m. and 3 p.m. Weekdays, 3 p.m. and 4 p.m. Sats. and Suns. Films: *Western Third—Australia; Oil Across the Rockies—Canada.*

NOW UNTIL 31 DEC. Imperial Institute, South Kensington, S.W.7. Exhibition: *Sir Alfred Bossom's Collection of the Arts and Crafts of the British Columbia Indians.*

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